REMARKS

Present Status of Application

The Office Action mailed June 09, 2003 rejected all presently pending claims 1-15. Specifically, claims 1-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaha (U.S. Pat. 6,297, 563) in view of Lu et al. (U.S. Pat. 6,100,573).

Summary of Applicant's Invention

The Applicant's invention is directed to a bonding pad structure. The bonding pad structure comprises a bonding pad, and a current conduction structure and a mechanical support structure under the bonding pad. The current conduction structure and the mechanical support structure are located over a device section and a non-device section, respectively, and each structure comprises a plurality of metallic layers and plugs.

The current conduction structure is electrically connected to the bonding pad and the substrate, and the mechanical support structure is electrically connected to the bonding pad and the substrate.

Discussion of Rejections under 35 U.S.C. 103

Claims 1-15 were rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaha (U.S. Pat. 6,297, 563) in view of Lu et al. (U.S. Pat. 6,100,573).

The Office Action considered that Yamaha substantially disclosed the structure of the present invention, and asserted that area structure A and B were comparable to the current conduction structure and the mechanical support structure of the present invention.

Applicant respectfully traverses this interpretation for at least the following reasons.

As mentioned above, one feature of the bonding pad structure of this invention is the current conduction structure over the device section and between (under) the bonding pad layer and the substrate for electrically connecting the bonding pad layer and the substrate, as recited in independent claims 1 and 8 with bold marks.

1. (Thrice Amended) A bonding pad structure, comprising:
a substrate having at least a device section and a non-device section;
a bonding pad layer above the substrate;
a current conduction structure over the device section, between the bonding pad layer and the substrate for connecting the bonding pad layer and the substrate electrically, wherein the current conduction structure includes:
a plurality of conductive metallic layers, wherein each conductive metallic layer is at a different height level from the substrate; and
a plurality of conductive plugs for linking neighboring conductive metallic layers and the conductive metallic layers with the bonding pad layer and the substrate;
a mechanical support structure connecting with the non-device section of the substrate, between the bonding pad layer and the substrate, wherein the mechanical support structure includes:
a plurality of support metallic layers, wherein each support metallic layer is at a different height level from the substrate; and
a plurality of support plugs for linking up neighboring support metallic layers and the support metallic layers with the bonding pad layer and the substrate; and
an insulation layer between the bonding pad layer, the current conduction structure, the mechanical support structure and the substrate for isolating the current conduction structure from the mechanical support structure.

8. (Thrice amended) A bonding pad structure, comprising:
a substrate having at least a device section and a non-device section;
a bonding pad layer above the substrate;
a current conduction structure over the device section, between the bonding pad layer and the substrate for connecting the bonding pad layer and the substrate electrically, wherein the current conduction structure includes:
a plurality of conductive metallic layer, wherein each conductive metallic layer is at a different height level from the substrate and ***one of the conductive metallic layers is in direct contact with the substrate***; and
a plurality of conductive plugs for linking neighboring conductive metallic layers and linking one of the conductive metallic layers with the bonding pad layer;
a mechanical support structure connecting with the non-device section of the substrate, between the bonding pad layer and the substrate, wherein the mechanical support structure includes:
a plurality of support metallic layers, wherein each support metallic layer is at a different height level from the substrate and ***one of the support metallic layers is in direct contact with the substrate***; and

a plurality of support plugs for linking neighboring support metallic layers and linking one of the support metallic layers with the bonding pad layer; and

an insulation layer between the bonding pad layer, the current conduction structure, the mechanical support structure and the substrate for isolating the current conduction structure from the mechanical support structure.

Applicant respectfully asserts that the structure claimed in the present invention patentably distinguishes over Yamaha's or Lu's structure, because the references at least lack these features emphasized above (*in bold*).

Applicant respectfully emphasizes that Yamaha's insulation film 12 (made of silicon dioxide or the like) covering on the substrate 10 **electrically isolate** the substrate 10 from the first-level wiring layer 14a and the first-level pad layer 14b (as shown in Fig. 1 and Col. 5, lines 59-62). Therefore, the stacked structure (including wiring layers and contact plugs 14a, 18a, 20a, 24a, 26a, 30a and 32a) in area A is electrically insulated from the substrate 10 due to the oxide insulation film 12.

The structure A of Yamaha is evidently not the current conduction structure of the present invention, because Yamaha's structure A is not electrically connected from the substrate. Yamaha fails to teach or suggest a current conduction structure over the device section, between the bonding pad layer and the substrate for electrically connecting the bonding pad layer and the substrate.

Furthermore, Yamaha does not disclose the device section and the non-device section in the substrate at all. Consequently, it is impossible that Yamaha disclose the mechanical support structure connecting with the non-device section of the substrate.

The Office Action alleged it obvious that Yamaha's area B is a mechanical support structure for the device and the mechanical structure connects with the non-device section of the substrate. However, no evidence or credible ground is provided

from the Office Action to justify this allegation.

As disclosed in Yamaha's statement (Col. 10, lines 37-65), wiring layers 14a, 20a, 26a are connected to the pad layers 14b, 20b, 26b by wiring patterns 14c, 20c, 26c (Fig. 3). Therefore, Yamaha's area structures A and B are not detached structures, but are connected in each level conductive pad layer. On the contrary, the current conduction structure and the mechanical support structure of the present invention are detached structures, connected only by the top bonding layer. Hence, the area structures A and B are not equivalent to the current conduction structure and the mechanical support structure of the present invention.

As noted in the Office Action, Yamaha does not disclose that the metallic layers are in direct contact with the substrate for connecting the bonding pad layer and the substrate electrically. However, the Office Action asserted that it is obvious to provide the structure with the substrate connected to the bonding pad for eliminating the peel phenomenon caused by stress, as shown by Lu et al.

Applicant respectfully traverses this assertion.

Lu discloses forming a dielectric layer 302 over the substrate 300, and forming a first metal layer 304 and a second metal layer 306 in the dielectric layer. Lu teaches that openings a, b, c are formed in the first metal layer 304, resulting with a plurality of first metal layers 304 separated by the dielectric layer 302. Lu emphasizes that the peeling phenomenon is eliminated by openings formed in the metal layer to release the stress caused in the following fabricating process (col. 3, lines 2-4).

Therefore, even if combined, the combination of the cited references Yamaha and Lu would not arrive at the present invention, because the artisan will try to form openings

in the wiring material layers of Yamaha to solve the peeling problems. Lu fails to remedy the deficiencies of Yamaha's.

Thus, the combination of the cited references does not render the present invention obvious, as suggested by the Office Action. For at least the same reasons, dependent claims are submitted to patently define over the cited references.

Reconsideration and withdrawal of these rejections under 35 USC 103(a) are respectfully requested.

CONCLUSION

In view of the foregoing, it is believed that all pending claims are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

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